REPORT
CONE PENETROMETER SURVEY
SHALLOW SOIL VAPOR SURVEY
CAMPBELL PROPERTY
GREENLEAF AVENUE AND LOS NIETOS ROAD
SANTA FE SPRINGS, CALIFORNIA

JOB NO. 13262-014-42
AUGUST 14, 1986
LOS ANGELES, CALIFORNIA

Dames & Moore

33.0G/30-COV

Dames & Moore
445 South Figueroa Street, Suite 3500
Los Angeles, California 90071
(213) 683-1560 TWX: 910-321-4299
Cable address: DAMEMORE

August 14, 1986

Redevelopment Agency
City of Santa Fe Springs
11710 Telegraph Road
Santa Fe Springs, California 90670

Attention: Mr. Richard H. Weaver, Director

Subject: Report
Cone Penetrometer Survey
Shallow Soil Vapor Survey
Campbell Property
Greenleaf Avenue and Los Nietos Road
Santa Fe Springs, California

INTRODUCTION

Presented in this report are the results of cone penetrometer test (CPT) and shallow soil vapor probe surveys at the Campbell property in Santa Fe Springs, California. The site is shown relative to surrounding properties on Figure 1. Dames & Moore has previously conducted a preliminary investigation at the property (see our Draft Summary of Findings, dated May 19, 1986). The preliminary drilling and sampling program was designed to evaluate whether potentially hazardous compounds were present in materials present in what has been interpreted to be a former drilling mud sump. Boring and vapor probe locations relative to the estimated location of the sump are shown on Figure 2.

Interpretation of chemical test results from the previously conducted investigation indicate the presence of potentially hazardous chemical compounds in sump materials encountered during the drilling and soil sampling program. Priority pollutant organics were encountered in Borings DM-1, DM-2 and DM-3 (see Table 1).

PURPOSE AND SCOPE

The purpose of the current investigation has been to: (1) utilize the CPT data to better estimate the extent of the sump and associated soft materials at the site; and (2) utilize shallow soil vapor probes to assess the nature and concentration of organic vapors in the soils beneath the site. The scope of the investigation included a series of CPT soundings, interpretation of the data, estimation of the volume of sump and overburden materials, installation of three shallow soil vapor probes, measurement of total organic vapor and methane concentrations, collection of three vapor samples, analysis of the vapor samples for methane and non-methane hydrocarbons, and a brief discussion of several possible remedial measures.

FIELD INVESTIGATION

Cone Penetrometer Test Survey

On June 25, 1986, twenty-one CPT soundings were performed at the locations shown on Figure 3. The CPT was used for this investigation as it provides a rapid, continuous profile of soil characteristics with depth by electronically measuring the tip resistance and side friction on a 36 mm diameter cone. The ratio of side friction to tip resistance is called the friction ratio. The

sounding consists of pushing the instrumented cone into a soil deposit. The penetration rate is typically set at 2 cm/sec, following the provisions of the American Society of Testing Materials Standards (ASTM D-3441-75T). Estimates of the types of materials being encountered can be made using the tip resistance and friction ratio.

Our experience at other sites in the City of Santa Fe Springs indicates that buried drilling mud, drill cuttings, loose or soft fills, or other very low strength, compressible materials can be recognized by a distinctive CPT profile of extremely low tip resistance and side friction, with a correspondingly high friction ratio.

The CPT survey was terminated after Sounding C-21 as the cone rods snapped. The reason for the breakage is thought to be the result of encountering very dense sand. This coupled with the very weak mud, probably caused the cone rod to buckle. As a result, the southeast portion of the sump area was not fully explored.

Sounding plots are presented in Appendix A. Interpretation of the plots and a discussion regarding the materials encountered are presented in the investigative results section below.

Shallow Soil Vapor Probes, Vapor Monitoring, and Vapor Sampling

Shallow soil vapor probes were installed at three locations (Figure 2) to monitor and sample near-surface vapor. Specifically, near-surface vapors were monitored and analyzed to assess the explosive and/or toxic potential of shallow vapors as well as to assess the general composition and concentration of such vapors.

The vapor probes were constructed of 1-inch diameter steel pipe 6-feet long each. The lower end of the probe was fitted with a pointed steel driving tip. After installation, the probe was lifted off the tip to allow soil vapor to flow into the pipe and from which the vapor was sampled and/or the organic content of the vapor measured.

Vapor concentrations were measured over fifteen minute periods with a Century Systems Model 128 organic vapor analyzer (OVA) and a gas Tech Model NP 204 Natural Gas Indicator (NGI). The OVA has a detection range of 0.2 to 1,000 ppmV THC, a field precision of 30 percent and an accuracy of 50 percent. The NGI has a detection range of 0.1 to 100 percent hydrocarbon gas. It measures any combustible gas in the 0.1-5 percent range and methane only in the 5-100 percent range. The results of the vapor probe monitoring procedure are presented in Table 2.

A vapor sample was collected from each of the vapor probes for chemical analysis. The vapor samples were drawn through clean Teflon tubing with a peristaltic pump and collected in stainless steel cannisters. All connections

were carefully checked to minimize sample contamination and dilution. Chain-of-custody seals and sample labels were affixed to the sample containers at the time of collection. Sample labels contained the following information: date and time; sample location; sample number; field vapor concentration; collector's name; and general remarks. Completed chain-of-custody forms accompanied the sample to the analytical laboratory.

Analytical Testing Program

The vapor samples were analyzed by Certified Testing Laboratories, Inc., (CTL), South Gate, California. The samples were analyzed for methane and non-methane hydrocarbons by packed column gas chromotography with flame ionization detection (GC/FID). Quality control was maintained by collecting and analyzing duplicates and trip blanks. The results of this analysis are summarized in Table 3 and presented in Appendix B.

INVESTIGATIVE RESULTS

Cone Penetrometer Test Survey

At least seven CPT soundings show the presence of very soft sump materials. An additional seven soundings, especially around the west end of the sump, appear to have passed through dessicated muds, loose fill or both, suggesting a somewhat extended sump area. The depths and thicknesses of the very soft materials, the zones of loose fill/desiccated mud and the overburden thicknesses are presented in Table 4.

Two approximations for the horizontal extent of the very soft material are shown on Figure 3. The inner zone, containing very soft materials has approximate plan dimensions of 100 feet by 175 feet with an average thickness of 10 feet. Very soft materials were encountered as deep as 18 feet. Including the overburden, the volume of the inner zone would be on the order of 10,000 to 12,000 cubic yards. Assuming that the outer zone represents the margin of the sump, with generally shallower depths of sump material, the additional volume is estimated to be on the order of 2,000 to 4,000 cubic yards.

These same margin soundings may also be interpreted as characterizing a natural clay. To adequately evaluate the southern and eastern limits of the sump, it will be necessary to conduct further CPT soundings and/or borings when the buildings are removed. At that time, it would be prudent to conduct additional borings along the possible outer margins of the sump to confirm our interpretations of desiccated sump materials.

Shallow Soil Vapor Probes

The vapors detected in the vapor probes (Table 2) and the analytical results of the shallow soil vapor samples (Table 3) suggest that the vapors detected appear to originate from two separate sources. Those detected in VP-1 may be the result of lateral migration of vapor through the subsurface from the adjacent Waste Disposal, Inc. site. The vapors detected in VP-3 appear to originate from the sump materials in the subsurface at the Campbell site. The low concentrations of vapors in VP-2 also suggest separate sources for the higher concentrations in VP-1 and VP-3. We feel that vapors will be a concern during any future excavation activities at the site. The need for vapor mitigation during site development should be reevaluated following site remediation.

REMEDIAL MEASURES

The presence of the very soft sump materials in the subsurface at the Campbell site poses two primary concerns:

1. From a geotechnical standpoint, these materials are unsuitable for structural support and should be processed or replaced prior to construction; and,

2. Potentially hazardous chemical compounds present within the sump materials may be required by the State of California Department of Health Services (DHS) to be removed from the site and disposed of at an approved waste site.

Two possible remediation methods are discussed below. In evaluating these methods, it must be recognized that the overburden cannot be easily segregated from the underlying soft sump materials as any excavation proceeds. As above in the volume estimates, the overburden is included in the cost estimates presented below.

Similar sites in Santa Fe Springs and other areas have been remediated by excavating the sump materials, mixing them with onsite and/or import fill materials and compacting the material as an engineered fill. The proportions are generally about three parts nonsump material to one part sump material. A preliminary cost estimate for this method of remediation, based on the limited information obtained to date, is about $5 to $10 per cubic yard. Thus, costs could range from $60,000 to $160,000 for an onsite remediation program. We

recommend that a 50 percent allowance be included in any budgets for this effort to address unexpected conditions which may be encountered as the mud is being excavated.

If the DHS does not allow onsite use of the sump material, the sump contents will need to be removed and disposed at an appropriate hazardous waste landfill. Disposal of solid waste at a Class I landfill generally costs on the order of $250 per cubic yard. Thus, if all of the sump materials were to be disposed of at a Class I site, disposal costs alone could range from $3 million to $4 million. Further chemical analyses to better characterize the nature of the sump materials may demonstrate that not all of the sump material should be disposed of at a Class I landfill. If the DHS agreed to allow disposal at a Class II landfill (at costs on the order of $100 per cubic yard), disposal costs would still be on the order of $1.2 million to $1.6 million.

Based on the above estimated costs, we recommend that discussions be held with the DHS as soon as possible to obtain their preliminary interpretation of the chemical test results. Depending on their interpretation, it may be prudent to further characterize the sump contents, and to develop a carefully designed excavation program to reduce the volume of material that will require disposal offsite. From a geotechnical point, and assuming that the sump contents are predominately drilling muds, it is our opinion that a satisfactory engineered fill can be constructed utilizing the sump contents.

Thank you for the opportunity to assist you on this interesting project. Please contact us if you have any questions regarding this report.

Very truly yours,

DAMES & MOORE

Robert D. Shanman, P.E.
Associate

Robert E. Troutman
Project Geologist

RDS:RET:pmt
(3 copies submitted)

TABLE 1

EPA METHOD 8270 RESULTS
(SEMI-VOLATILE PRIORITY AND NONPRIORITY POLLUTANTS)
CONCENTRATIONS GIVEN IN mg/kg (ppm)

BORING	DM-1	DM-2	DM-2	DM-3	DM-4
Depth (feet)	6.0	8.5	11.0	16.0	3.5
Naphthalene	0.2	21.0	16.0	40.0	ND
Di-n-butyl phthalate	2.3	ND	1.3	ND	0.39
Fluorene	ND	35.0	5.2	12.0	ND
Phenanthrene	ND	48.0	6.7	15.0	ND
Isophorone	ND	ND	4.7	ND	ND
Chrysene	ND	ND	2.2	ND	ND
2-methyl -naphthalene	0.14	430.0	48.0	78.0	ND

Note: Samples tested but not listed did not contain detectable concentrations of EPA Method 8270 compounds. Compounds not listed were not detected in the samples which were analyzed.

ND: Not Detected

TABLE 2

SHALLOW SOIL VAPOR PROBE MONITORING RESULTS

Vapor Probe and Sample Number		Total Organic Vapor Concentration (ppm)(1) As Measured On An OVA	Total Combustible Organic Vapor/Methane As Measured On An NGI(%)(2)
VP-1	1	>1,000	0
	2	20,000	-(3)
	3	20,000	-
	4	20,000	-
	5	20,000	-
	6	20,000	-
VP-2(4)	1	>10	0
VP-3	1	>1,000	0
	2	21,000	-
	3	18,000	-
	4	20,000	-
	5	20,000	-
	6	18,000	-

(1) PPM = parts per million
(2) The NGI measures any combustible gas in the 0-5% range and methane only in the 5-100% range.
(3) - = Not measured
(4) Due to continuous malfunction of OVA only a single reading was obtained.

TABLE 3

SHALLOW SOIL VAPOR ANALYTICAL RESULTS

SAMPLE	METHANE (PPM)(1)	TOTAL NON-METHANE HYDROCARBONS AS HEXANE (PPM)(1)
VP-1	9,500	<10(2)
VP-2	<2.0(2)	<10(2)
VP-3	11,200	29

(1) ppm = parts per million

(2) the less than (<) symbol means "not present at or above the indicated value (detection limit)".

TABLE 4

INTERPRETED DEPTHS OF SUMP MATERIAL
BASED ON CPT SOUNDINGS

SOUNDING	INTERPRETED DEPTH OF VERY SOFT SUMP MATERIAL	INTERPRETED DEPTH OF DESICCATED SUMP MATERIAL	INTERPRETED DEPTH OF OVERBURDEN
C-1	5-18 feet	--	5 feet
C-2	2-10	--	2
C-3	--	2-11 feet	2
C-10	4-15	--	4
C-11	3-14	--	3
C-12	--	1-18	1
C-13	--	1-18	1
C-15	2-8	--	2
C-16	--	2-15	2
C-17	--	1-13	1
C-18	--	1-? (1)	1
C-19	--	2-? (1)	2
C-20	1-16	--	1
C-21	3-15	--	3

Note: (1) CPT appears to be on metal or concrete debris.

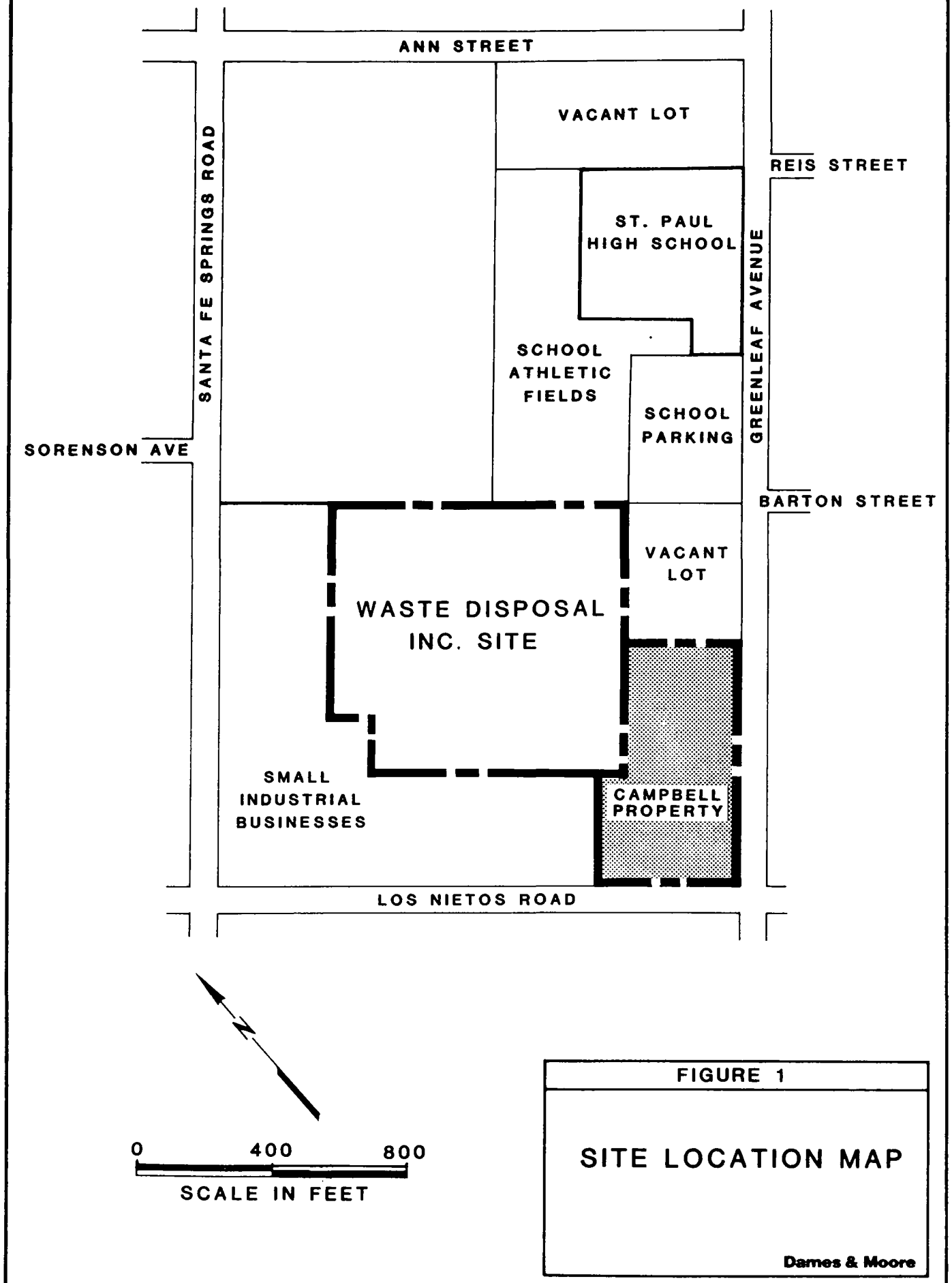

FIGURE 1

SITE LOCATION MAP

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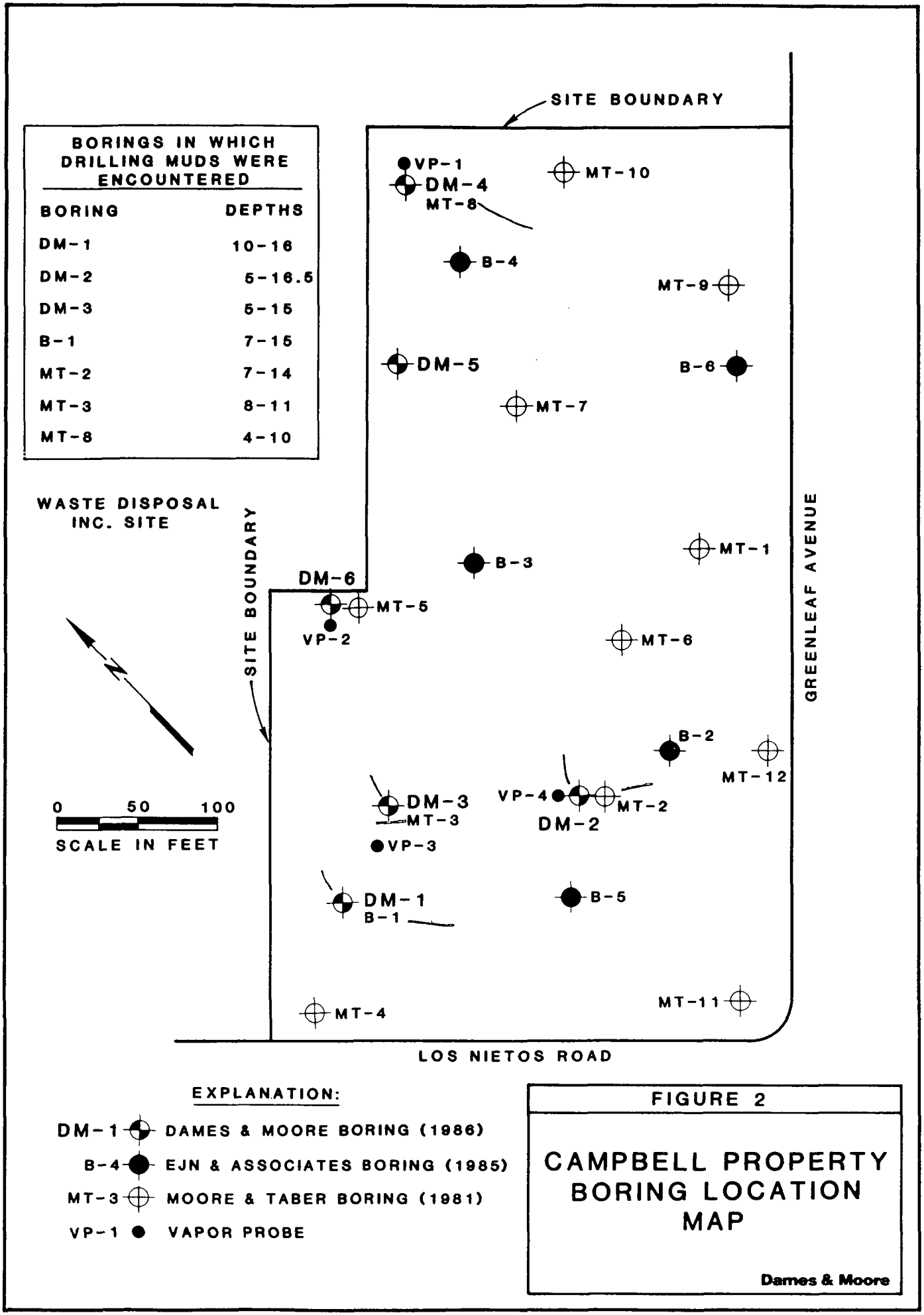

FIGURE 2

CAMPBELL PROPERTY BORING LOCATION MAP

Dames & Moore

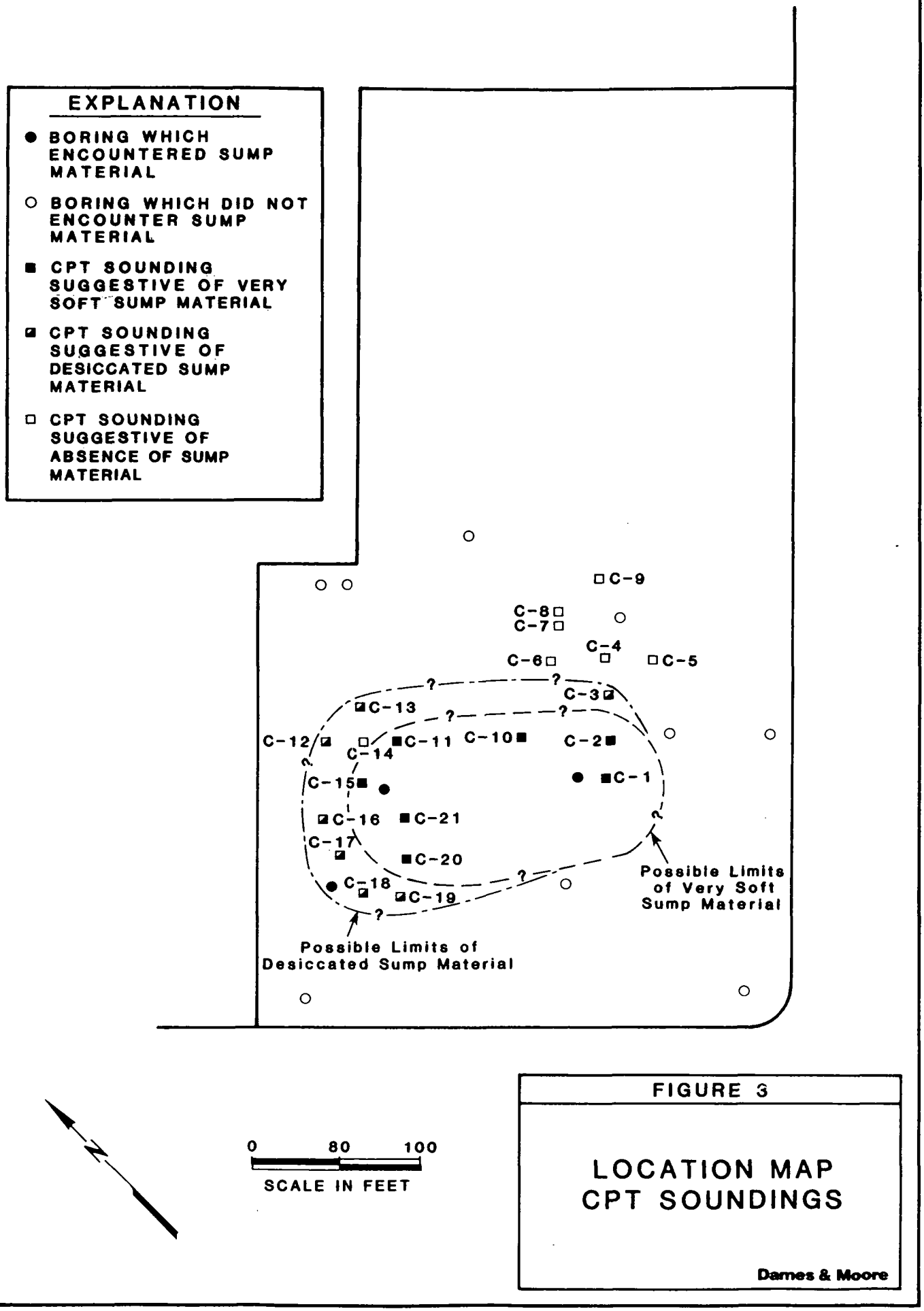

FIGURE 3

LOCATION MAP CPT SOUNDINGS

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APPENDIX A

CPT SOUNDING DATA

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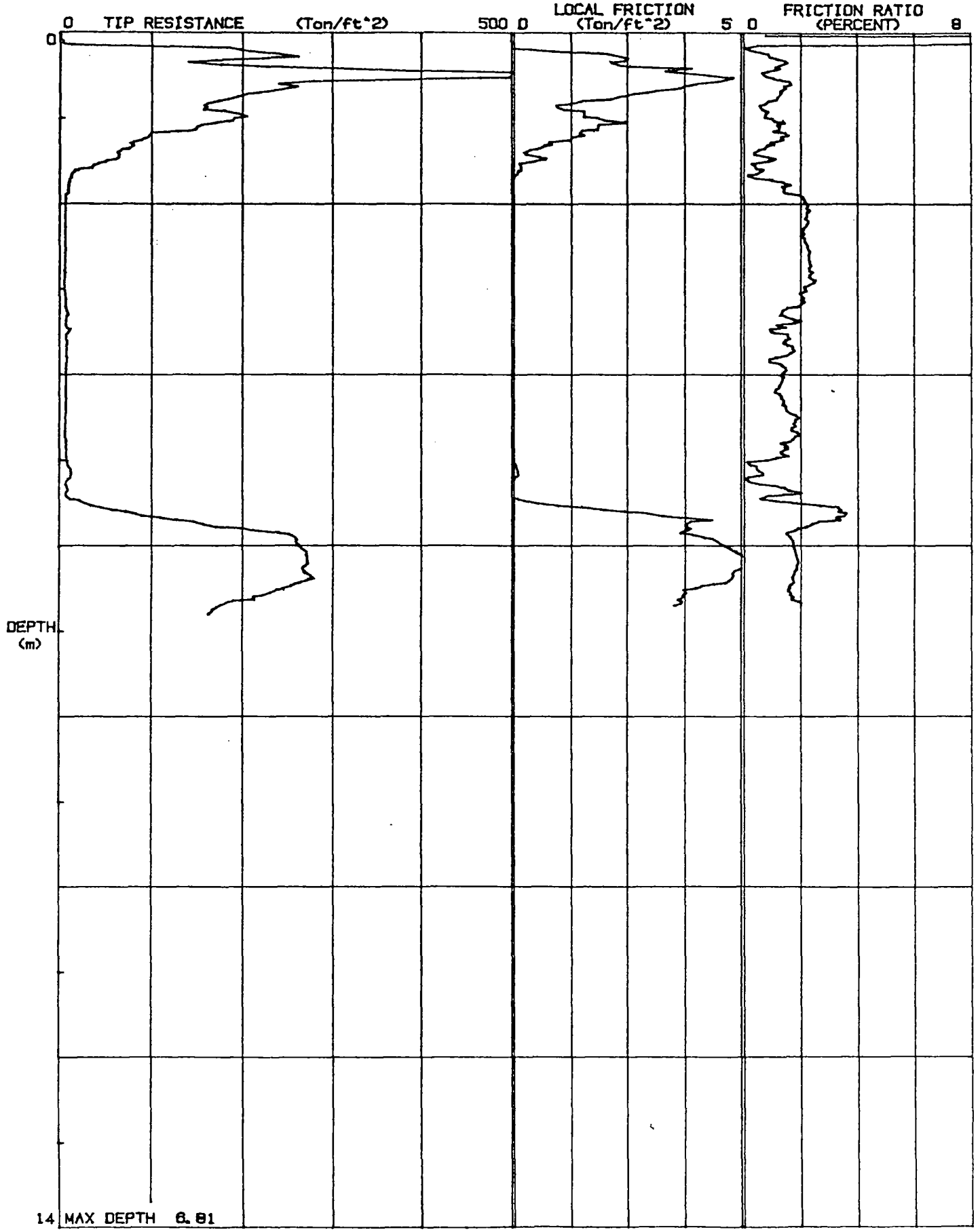

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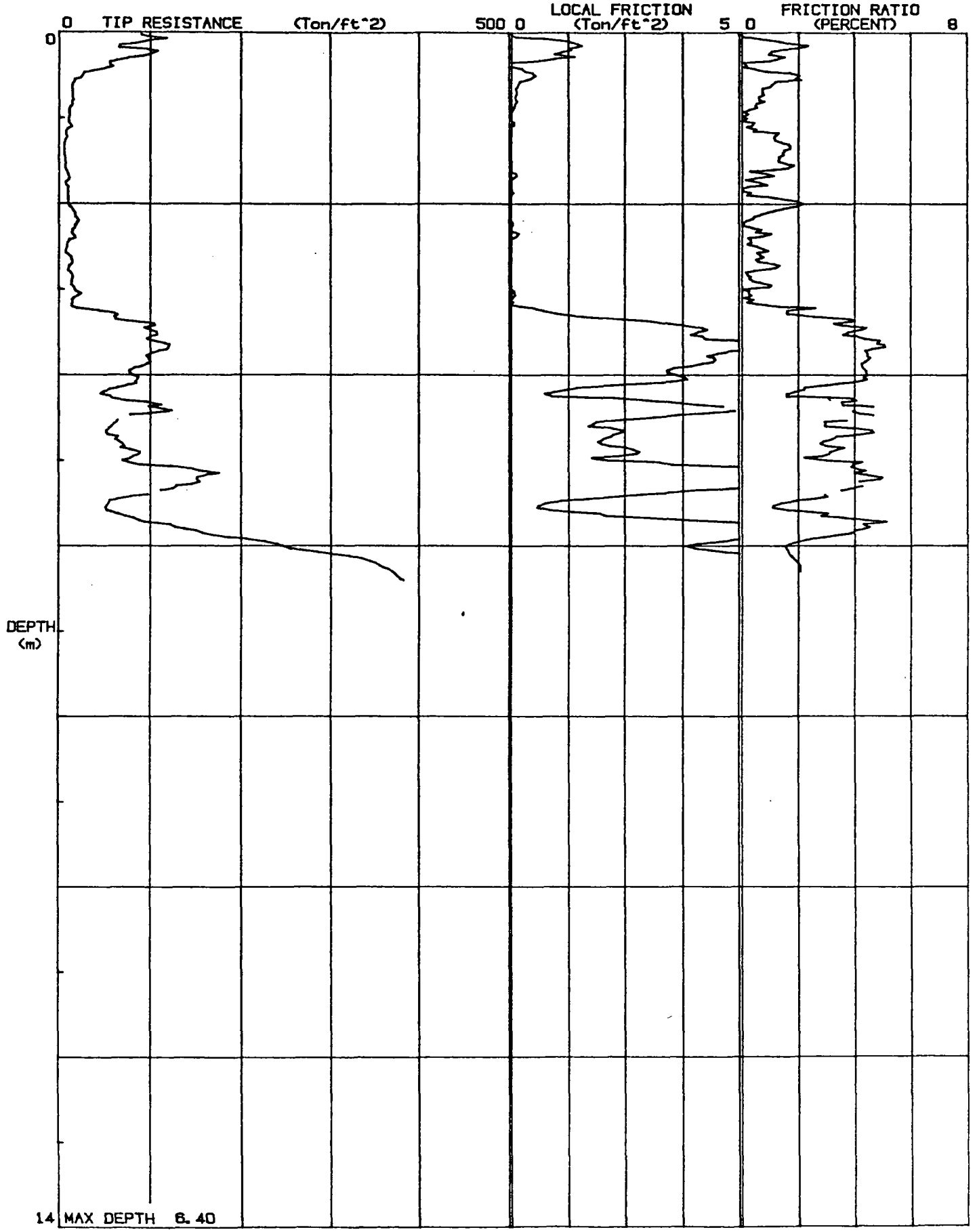

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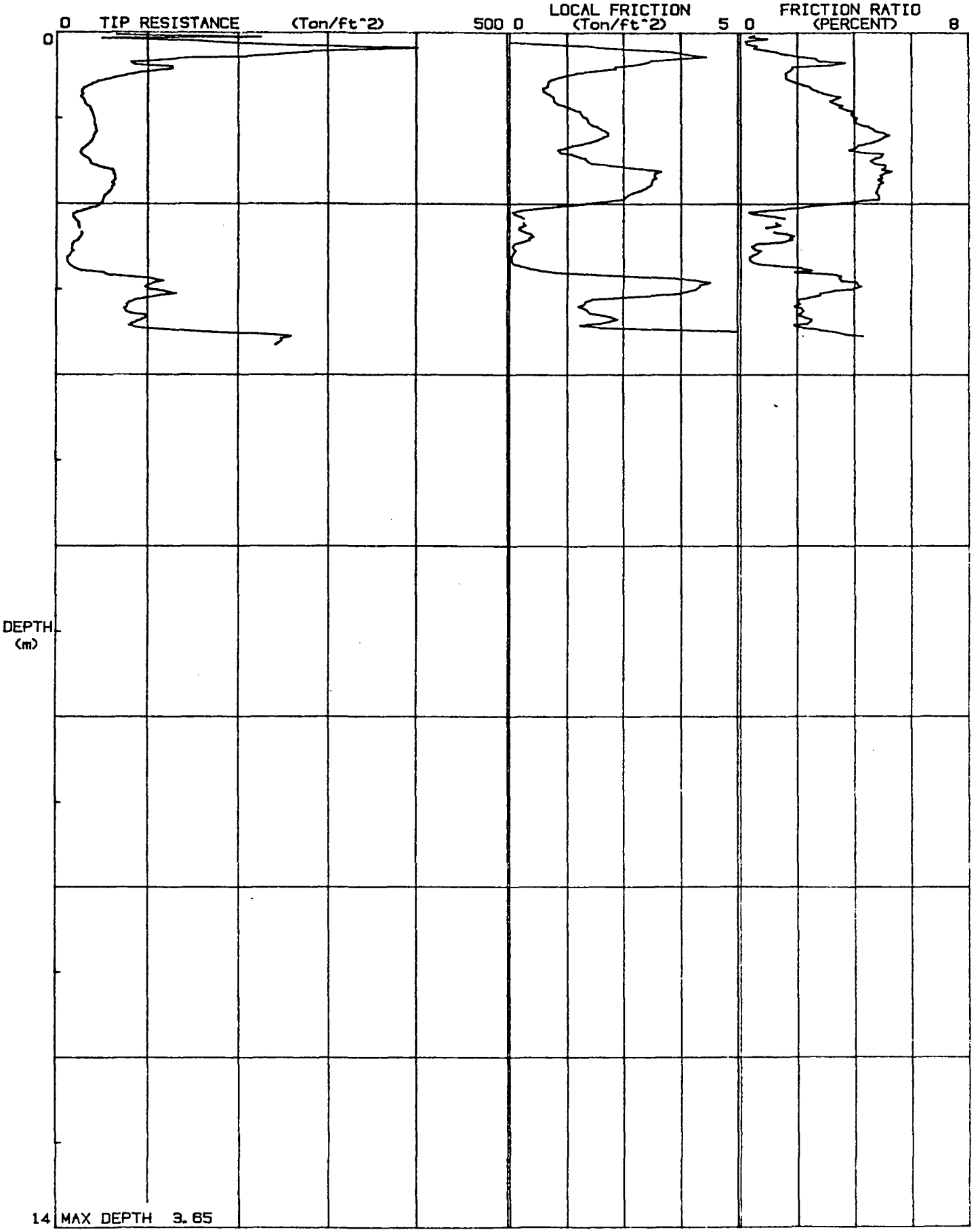

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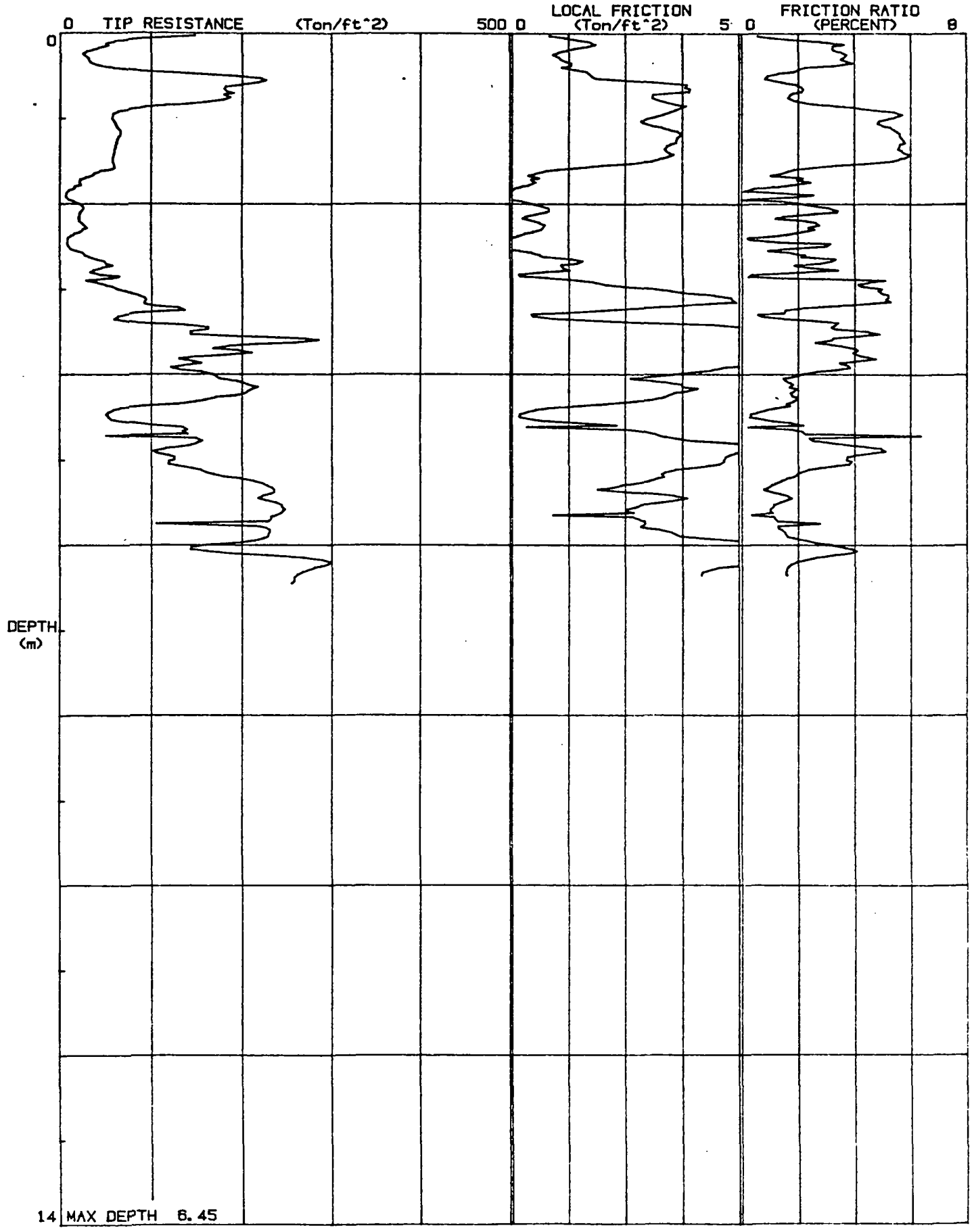

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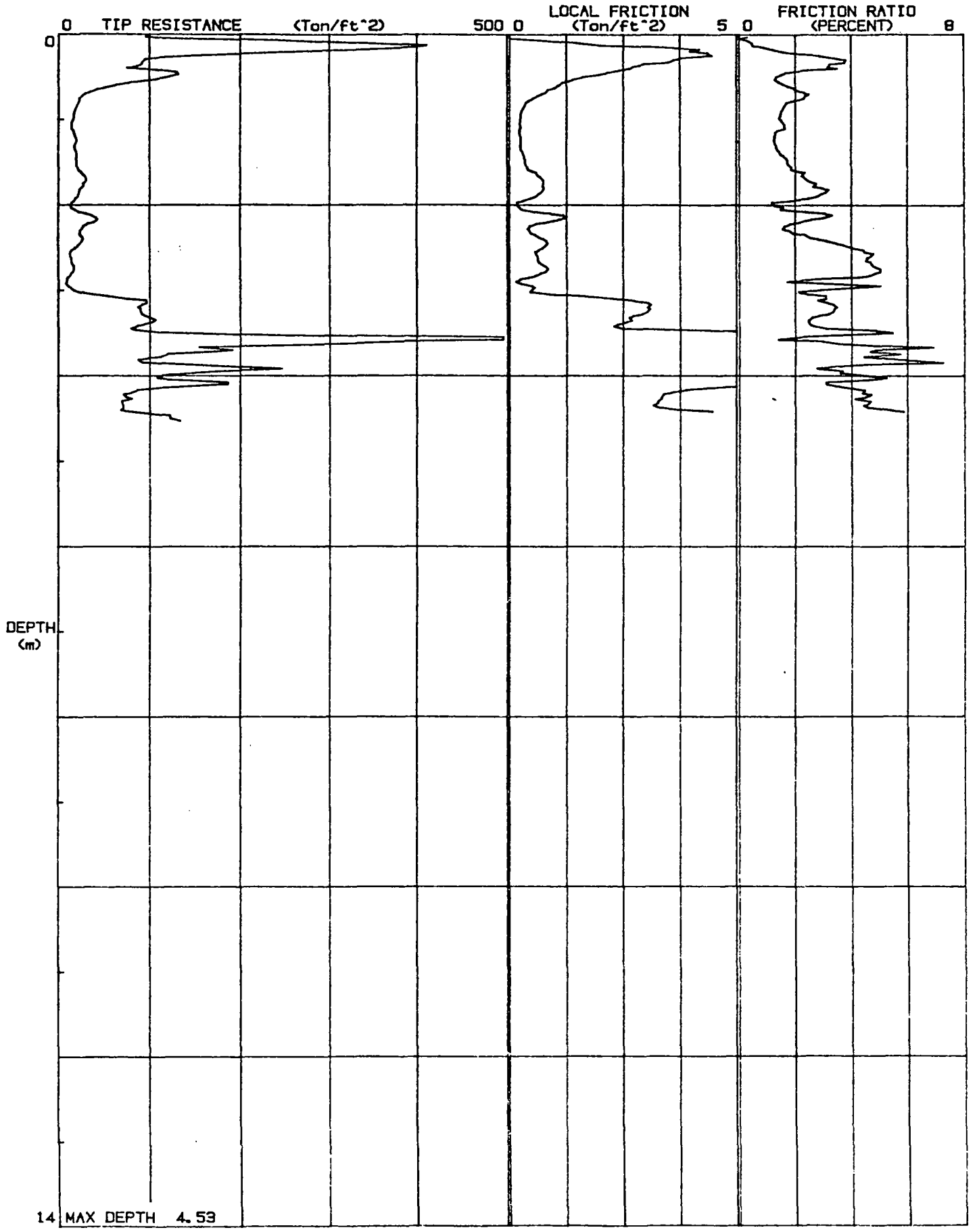

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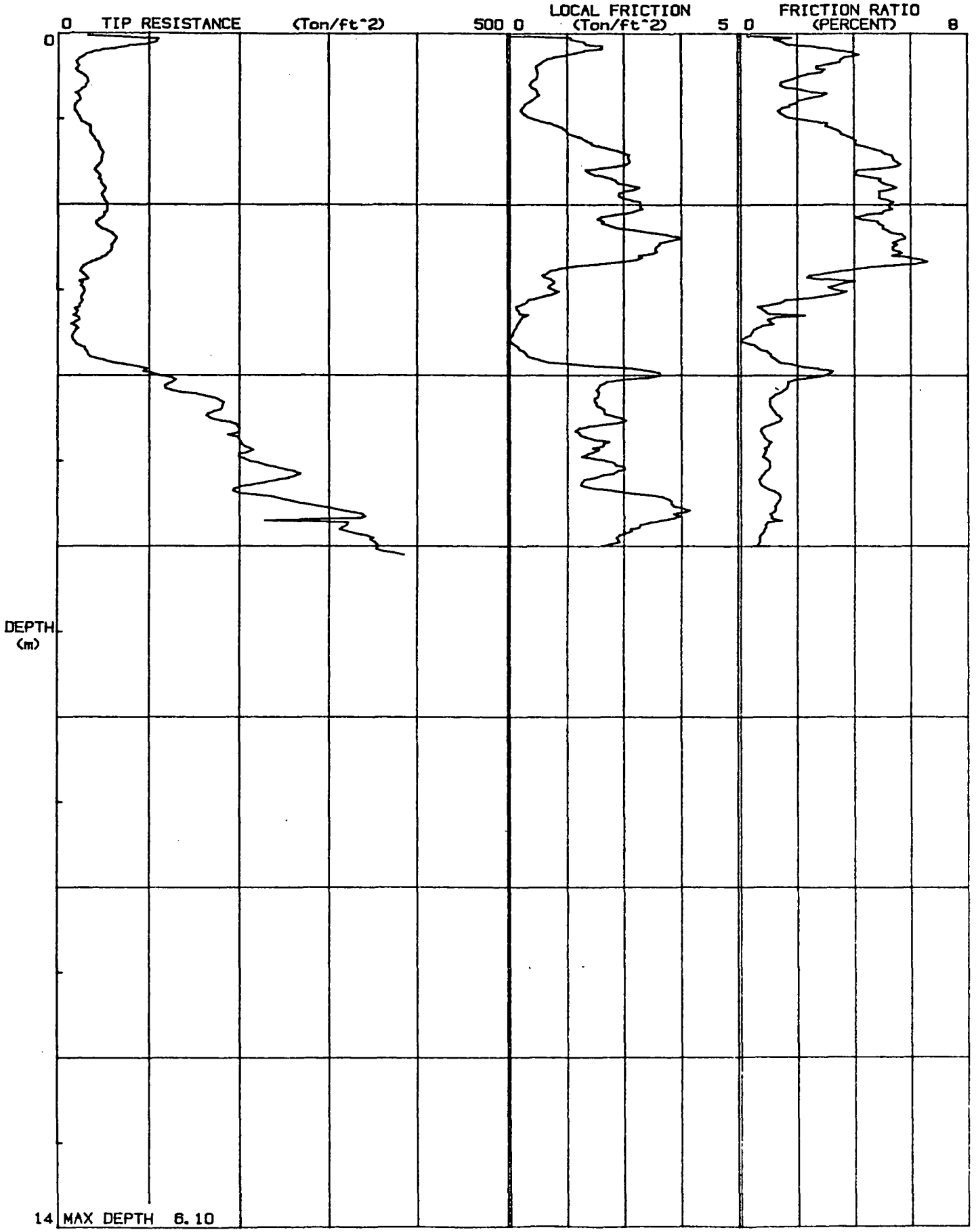

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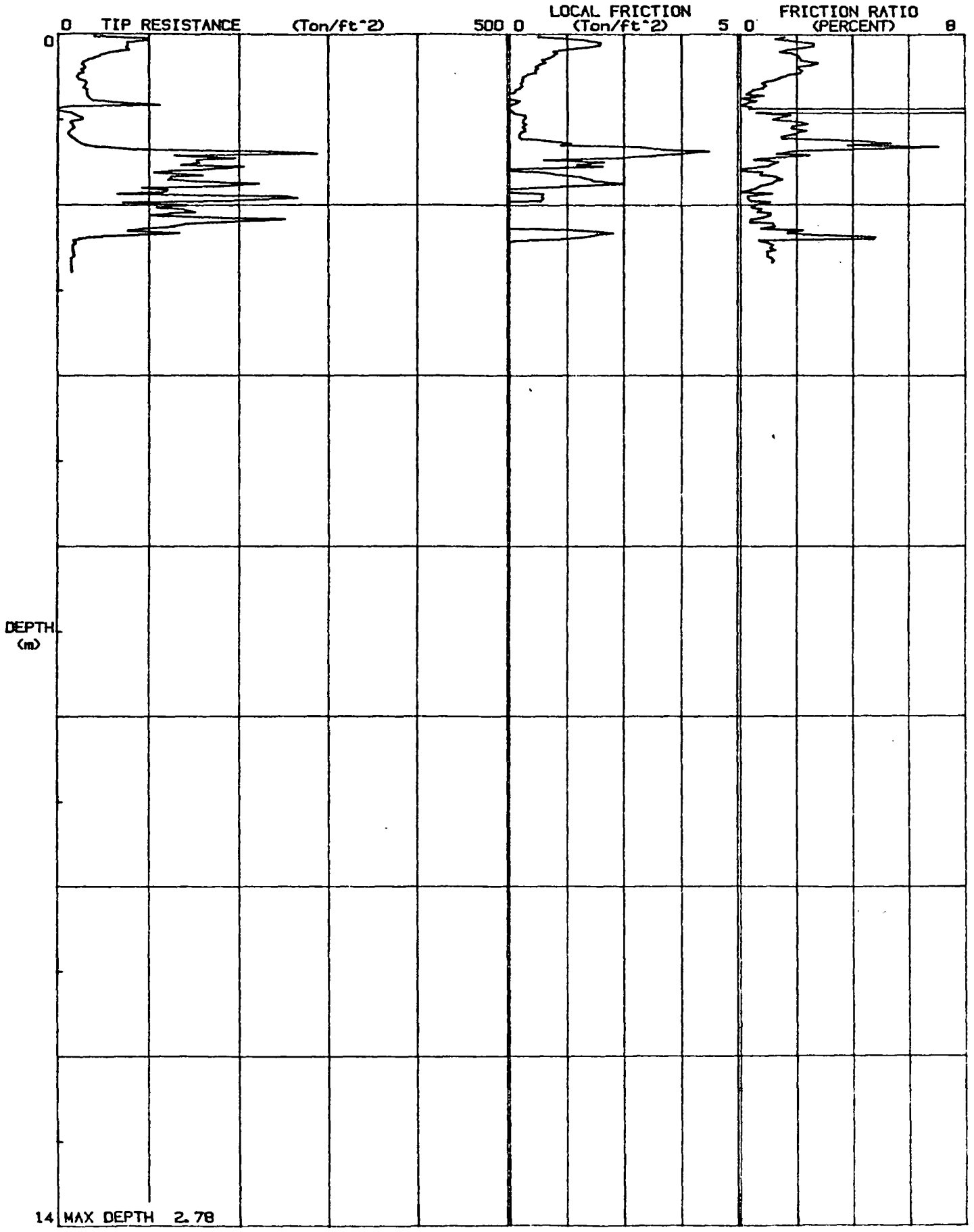

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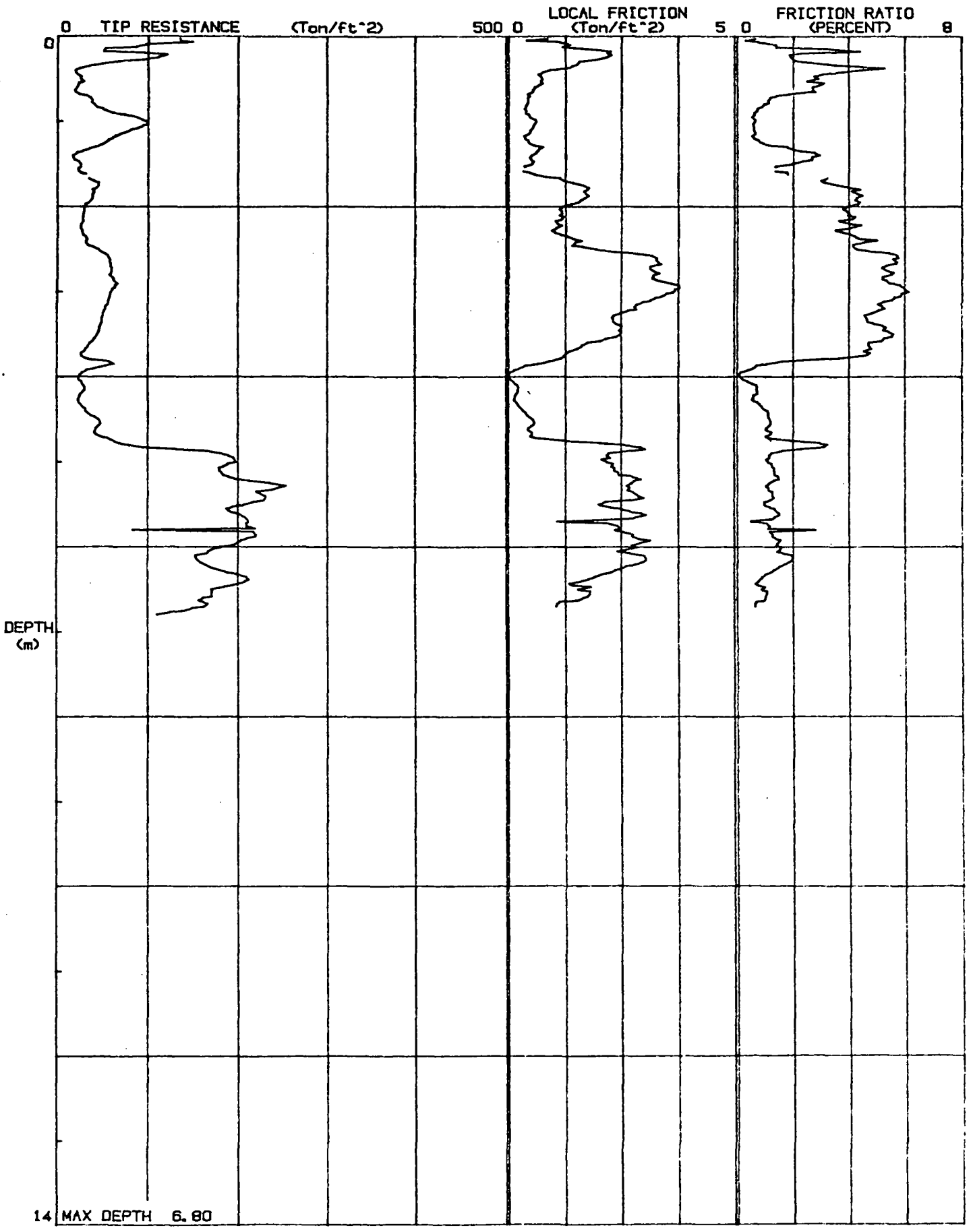

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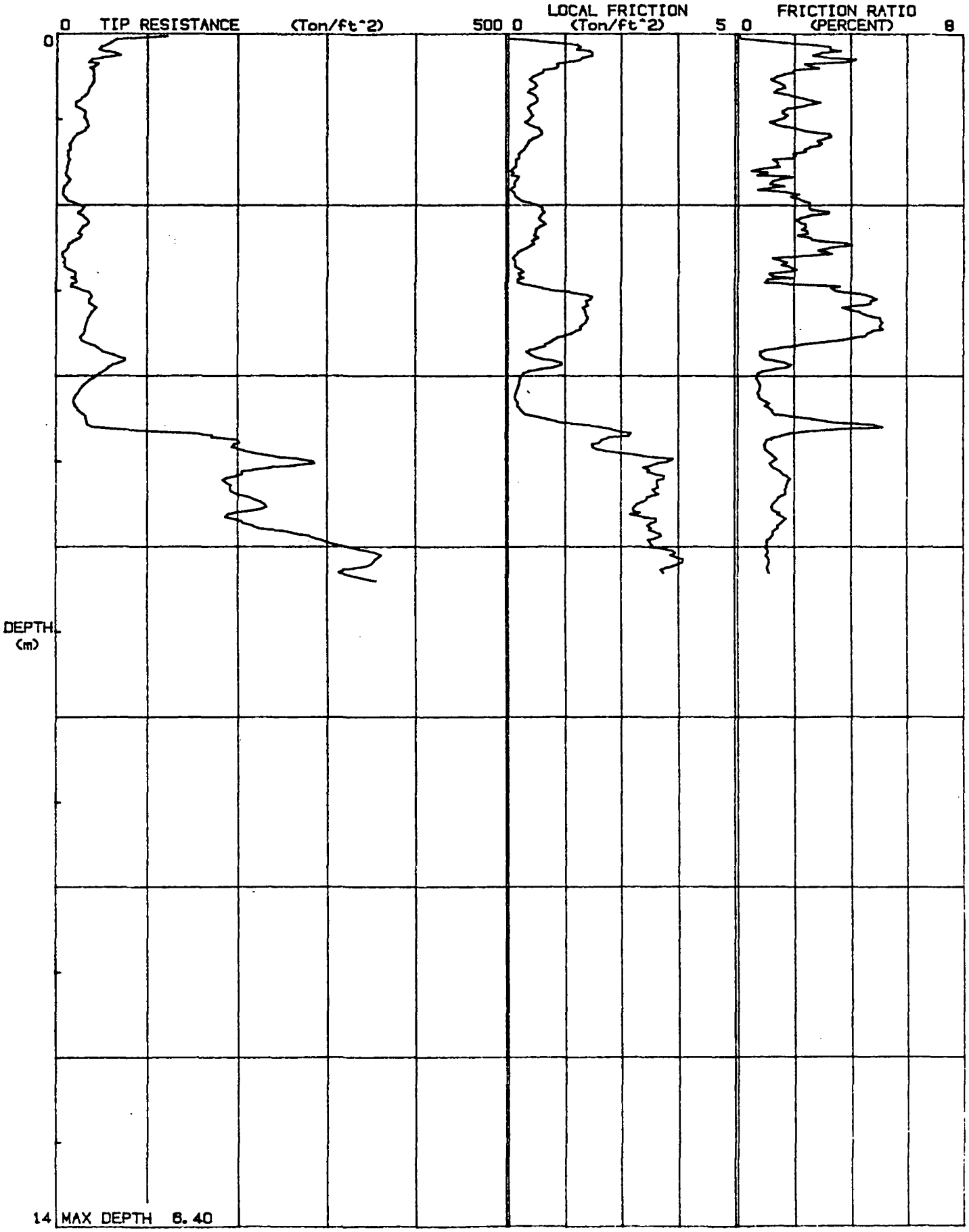

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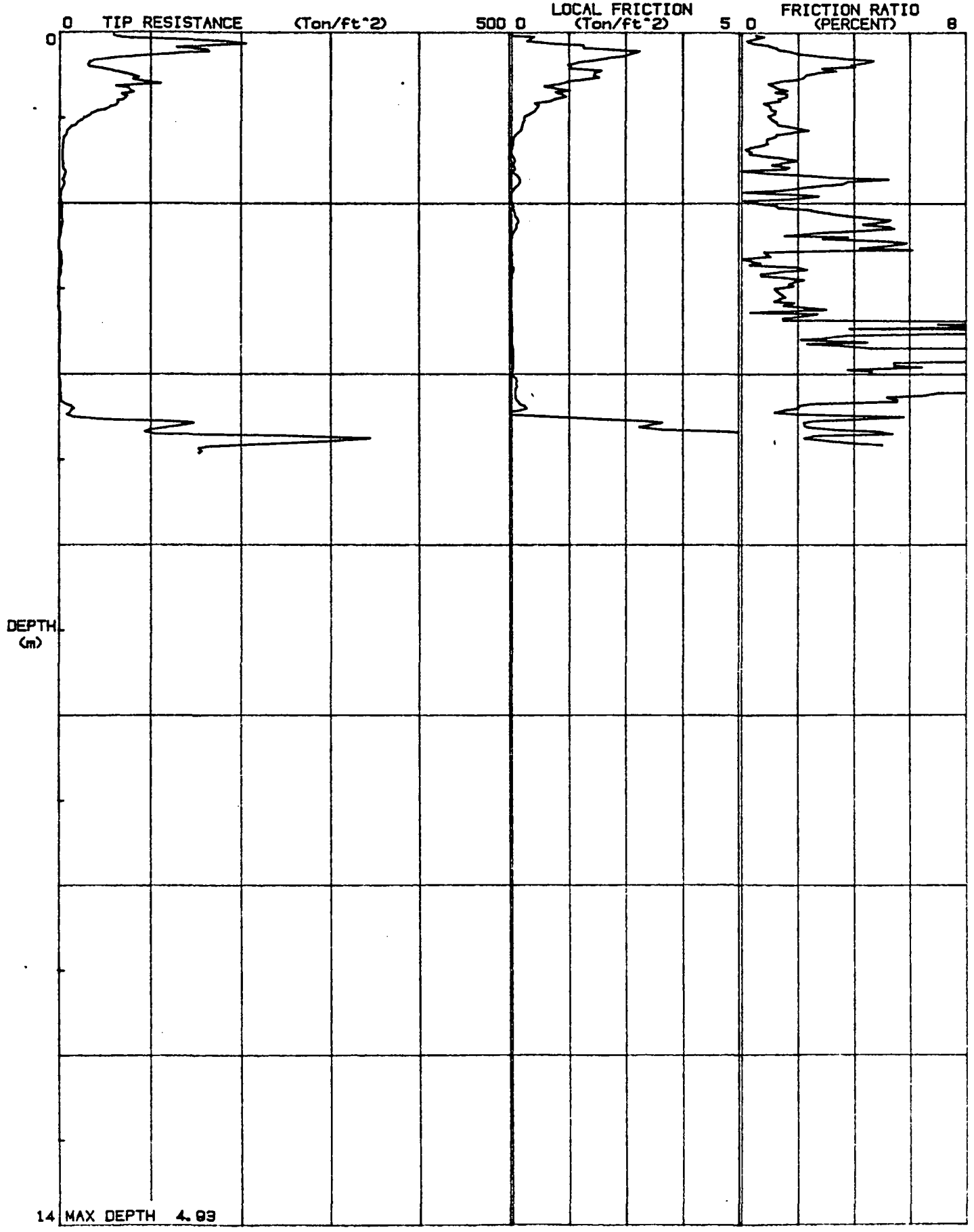

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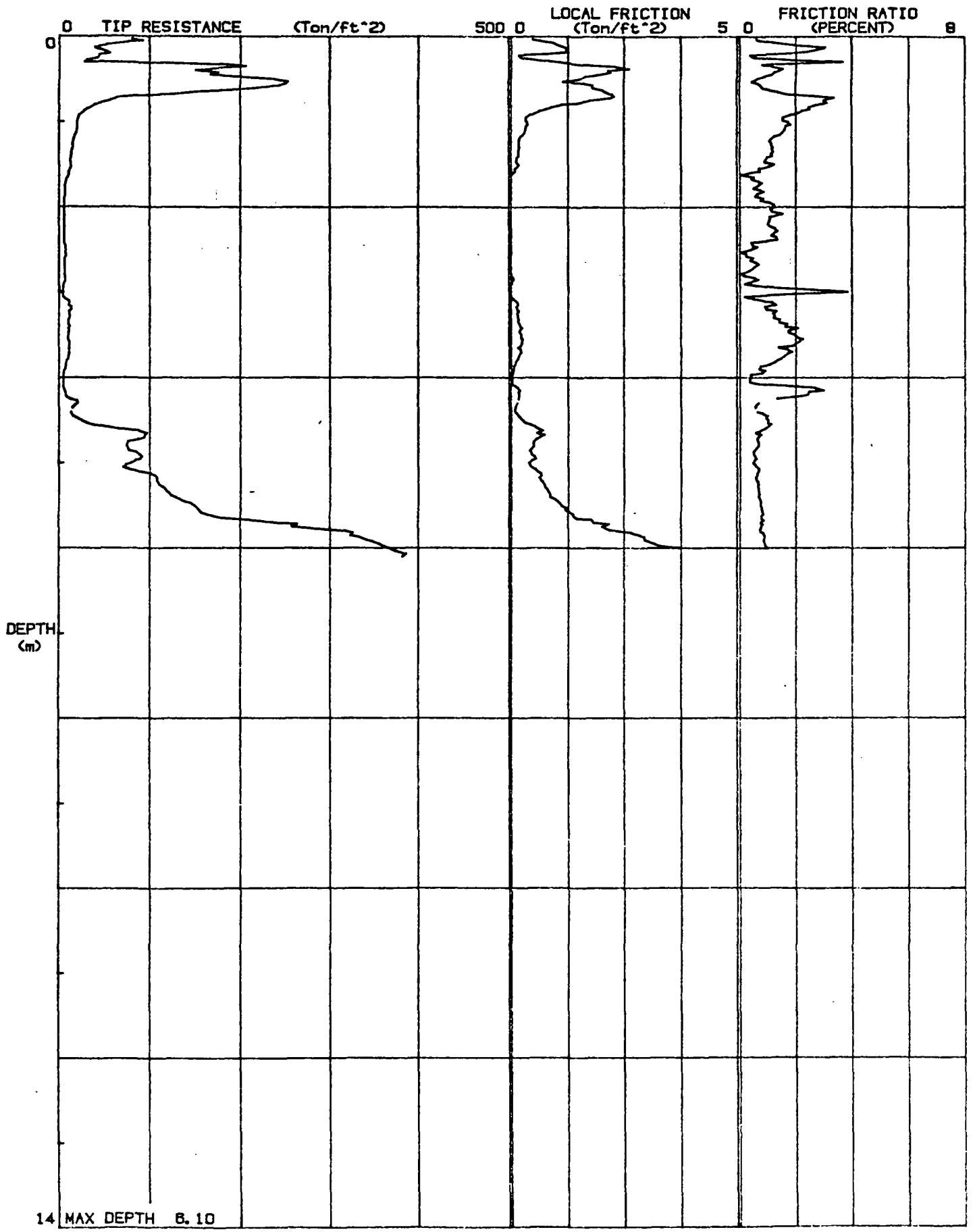

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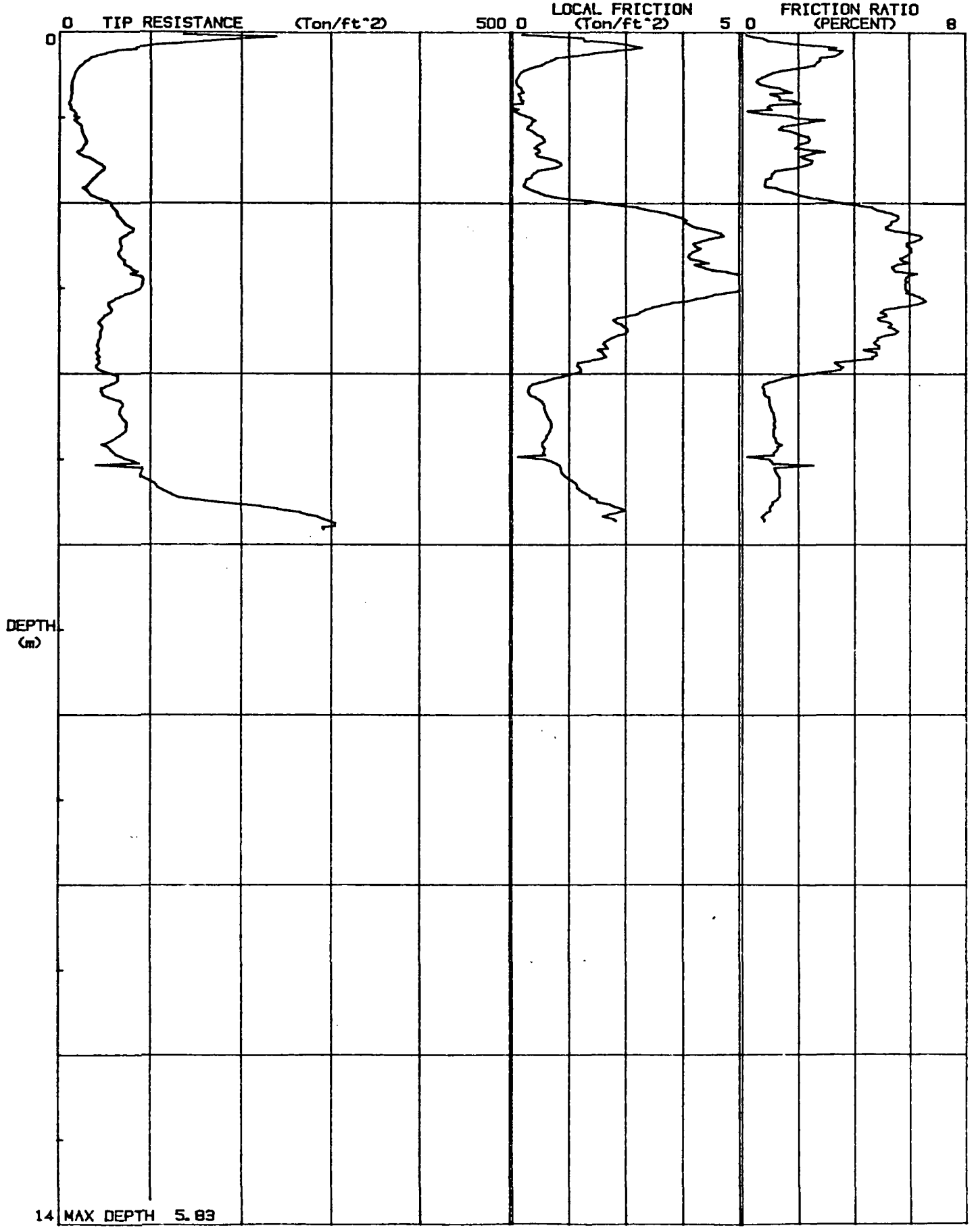

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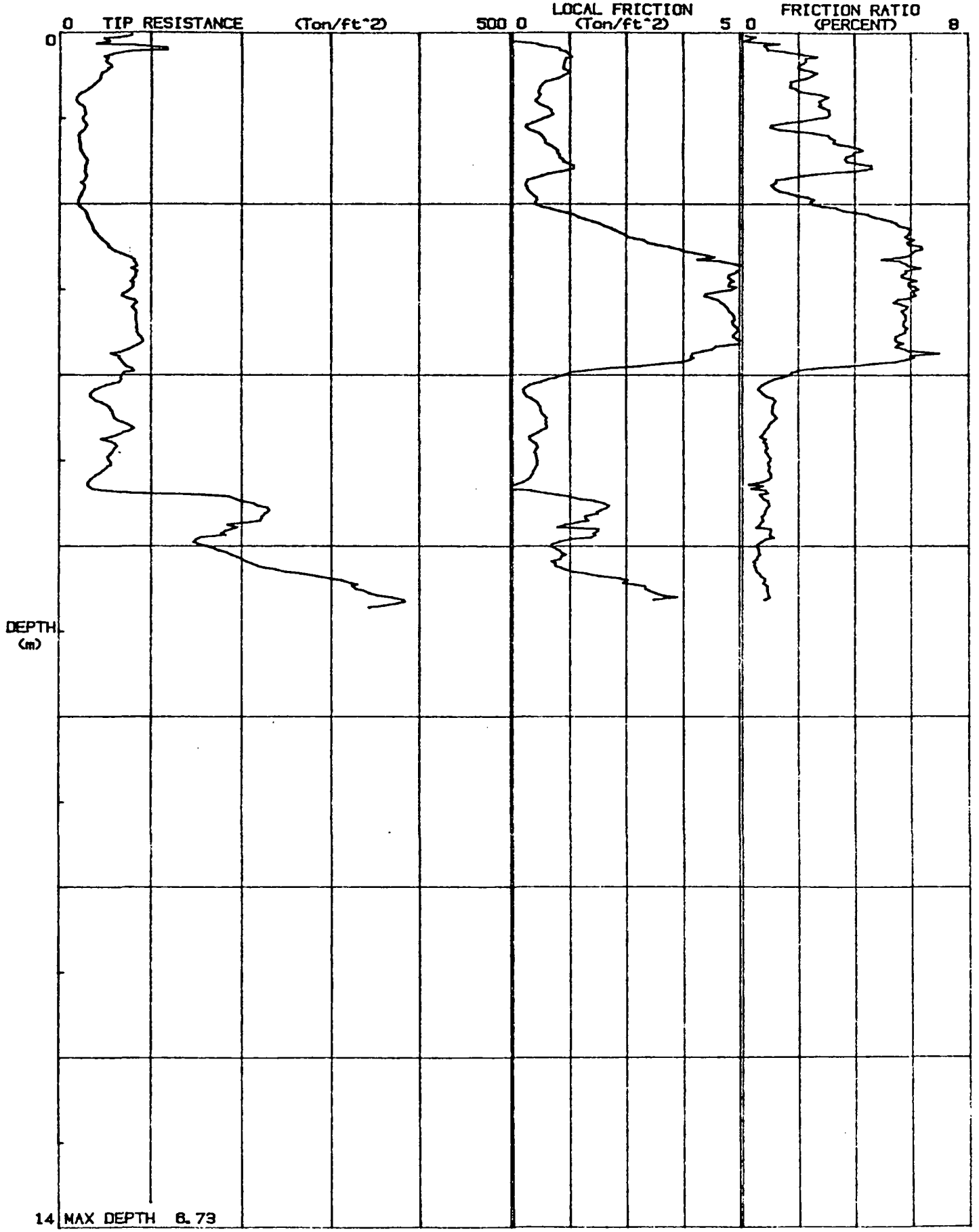

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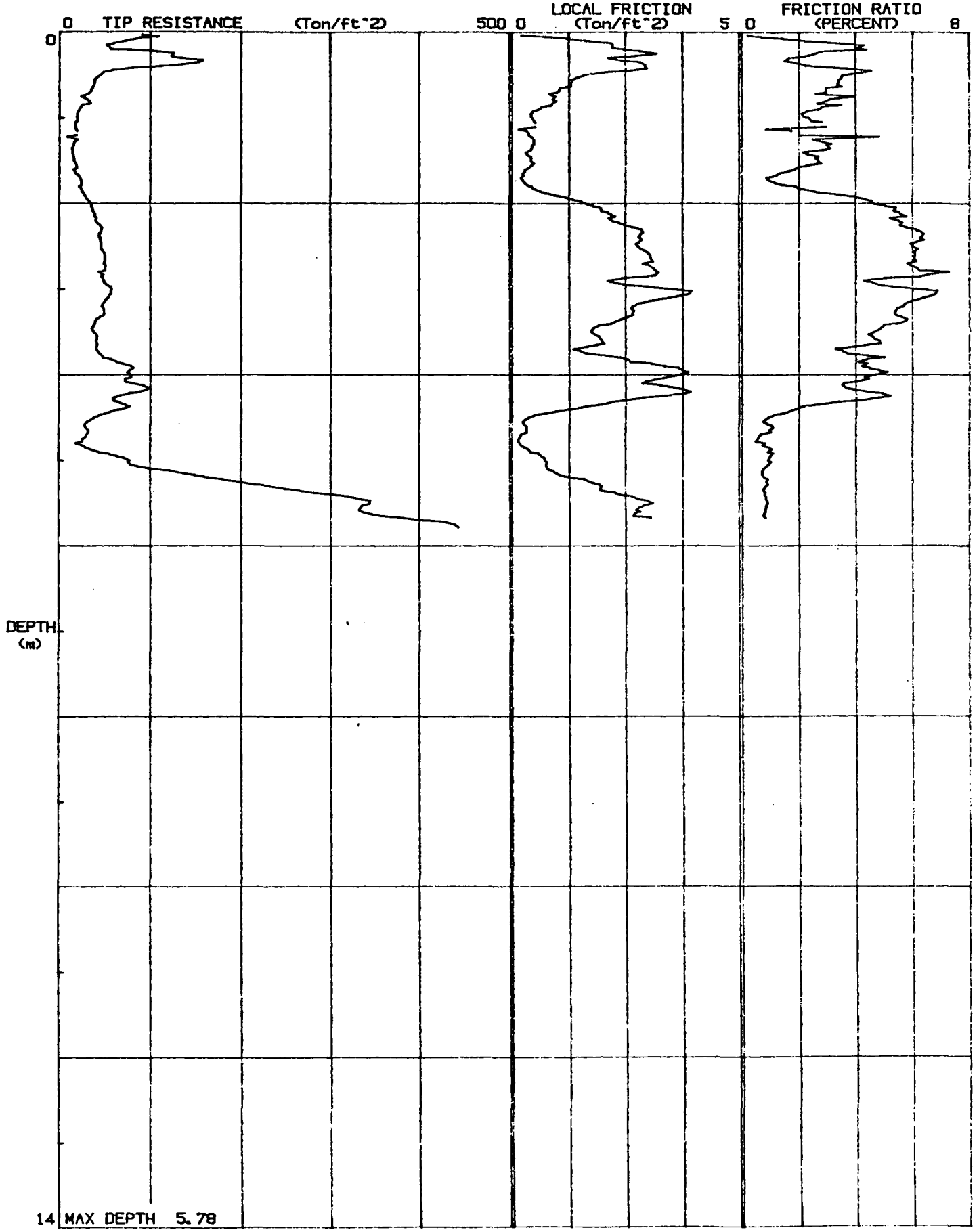

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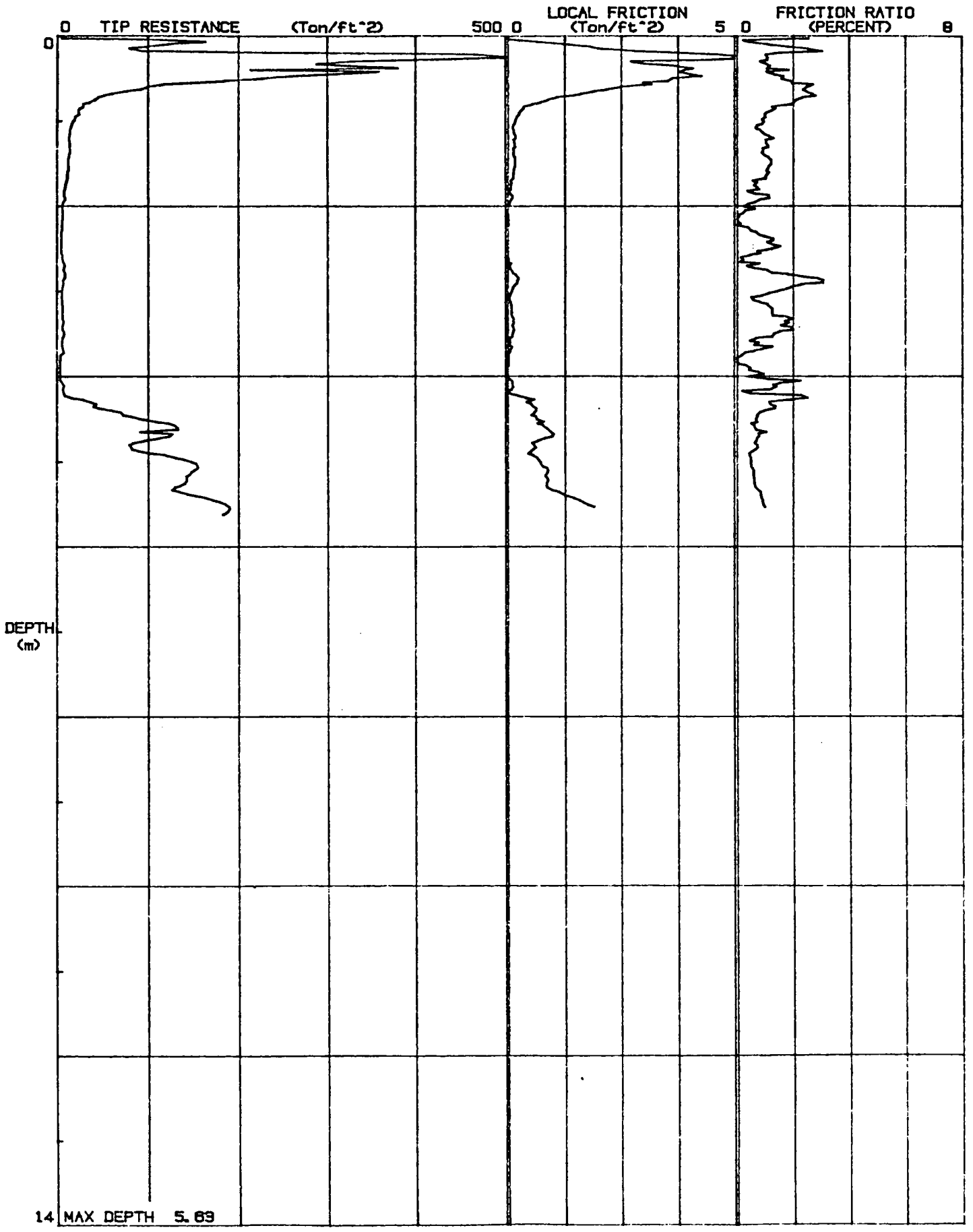

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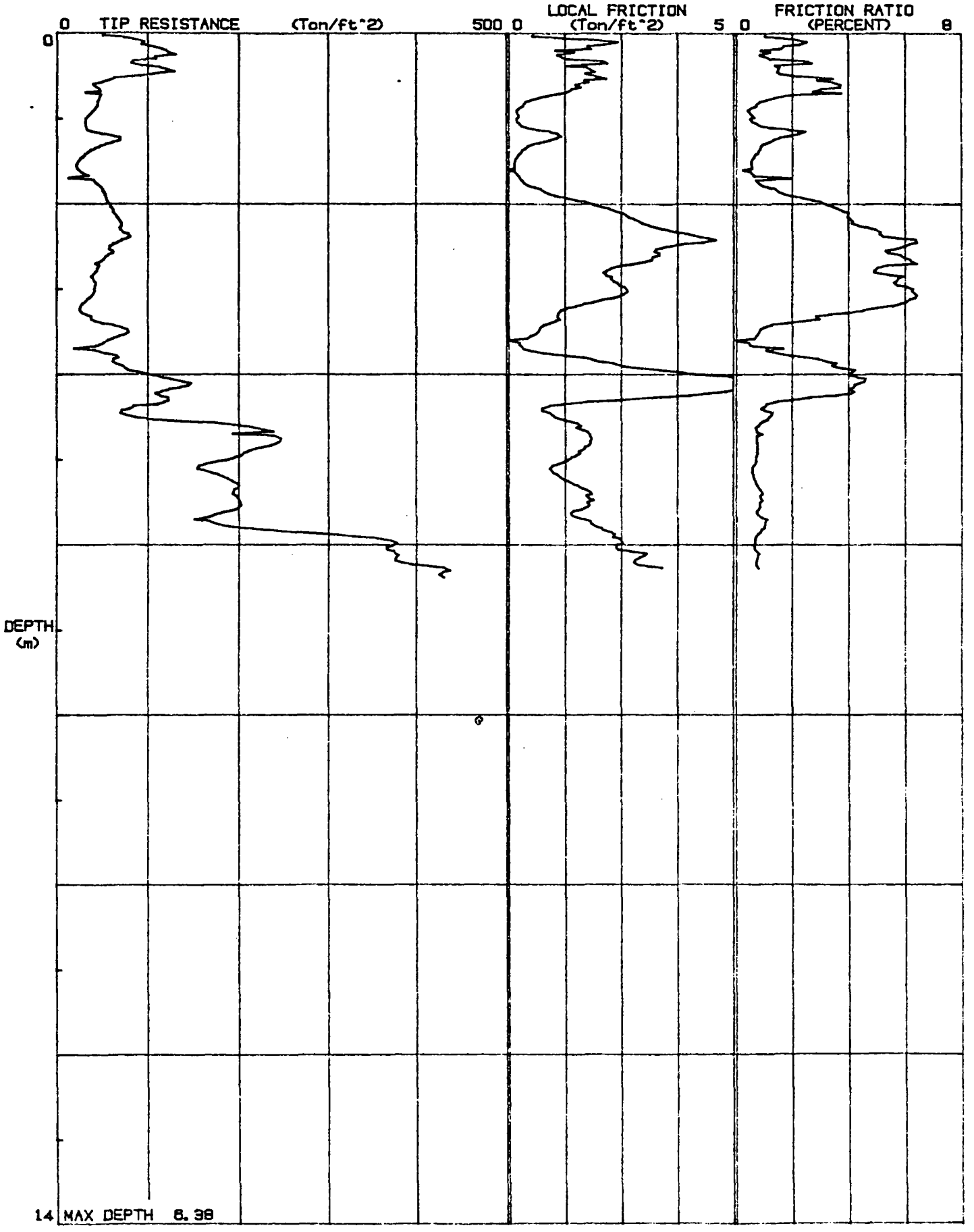

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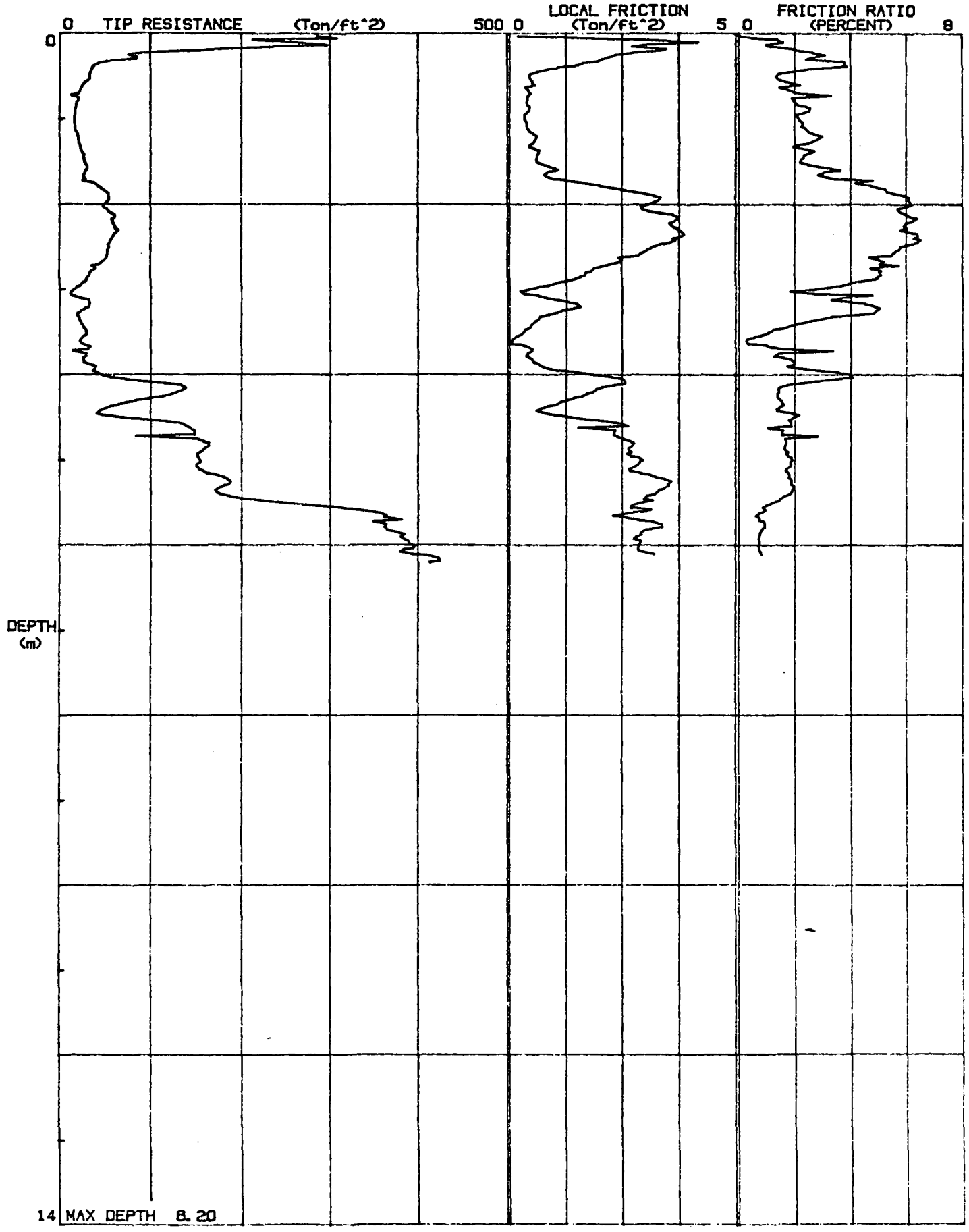

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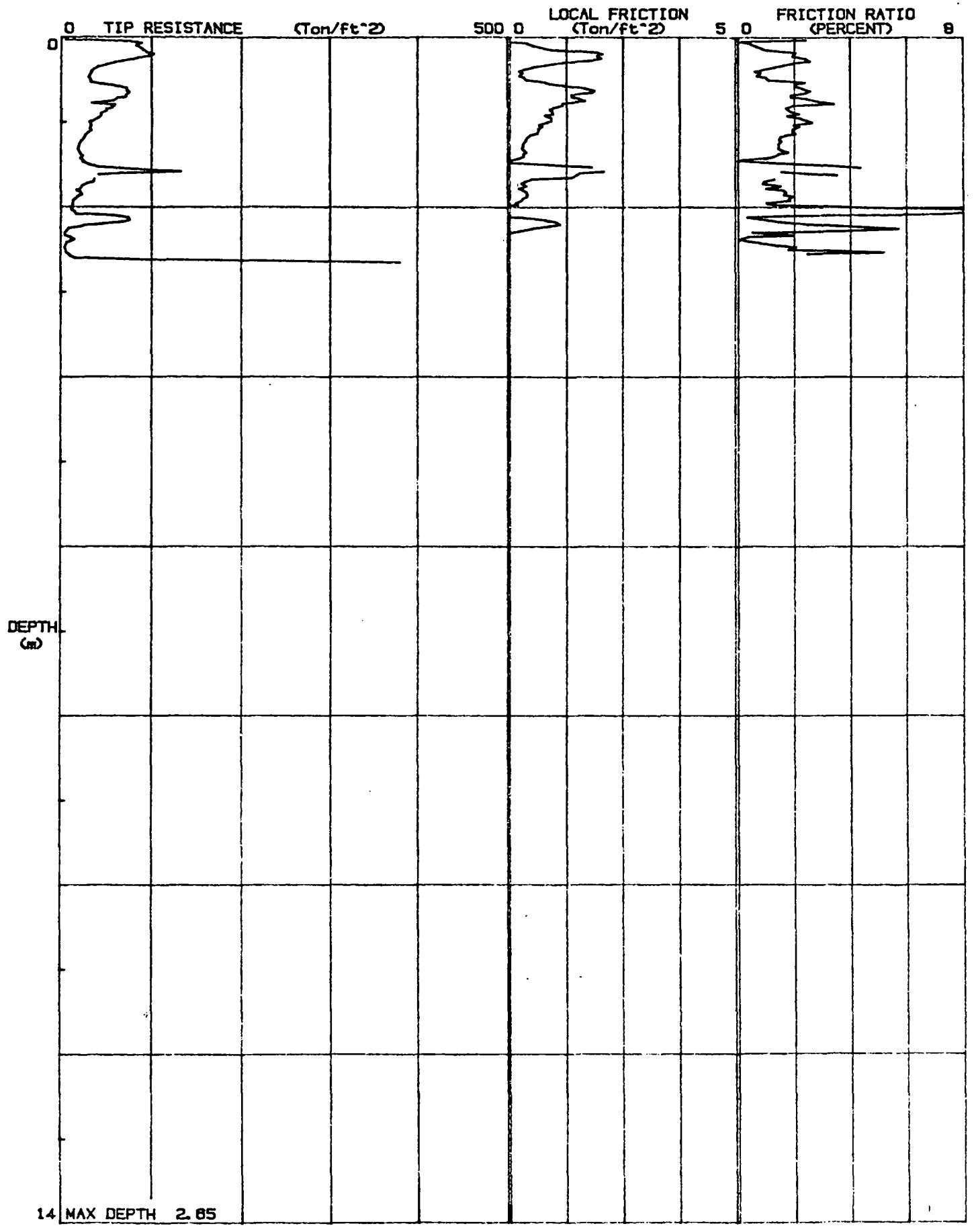

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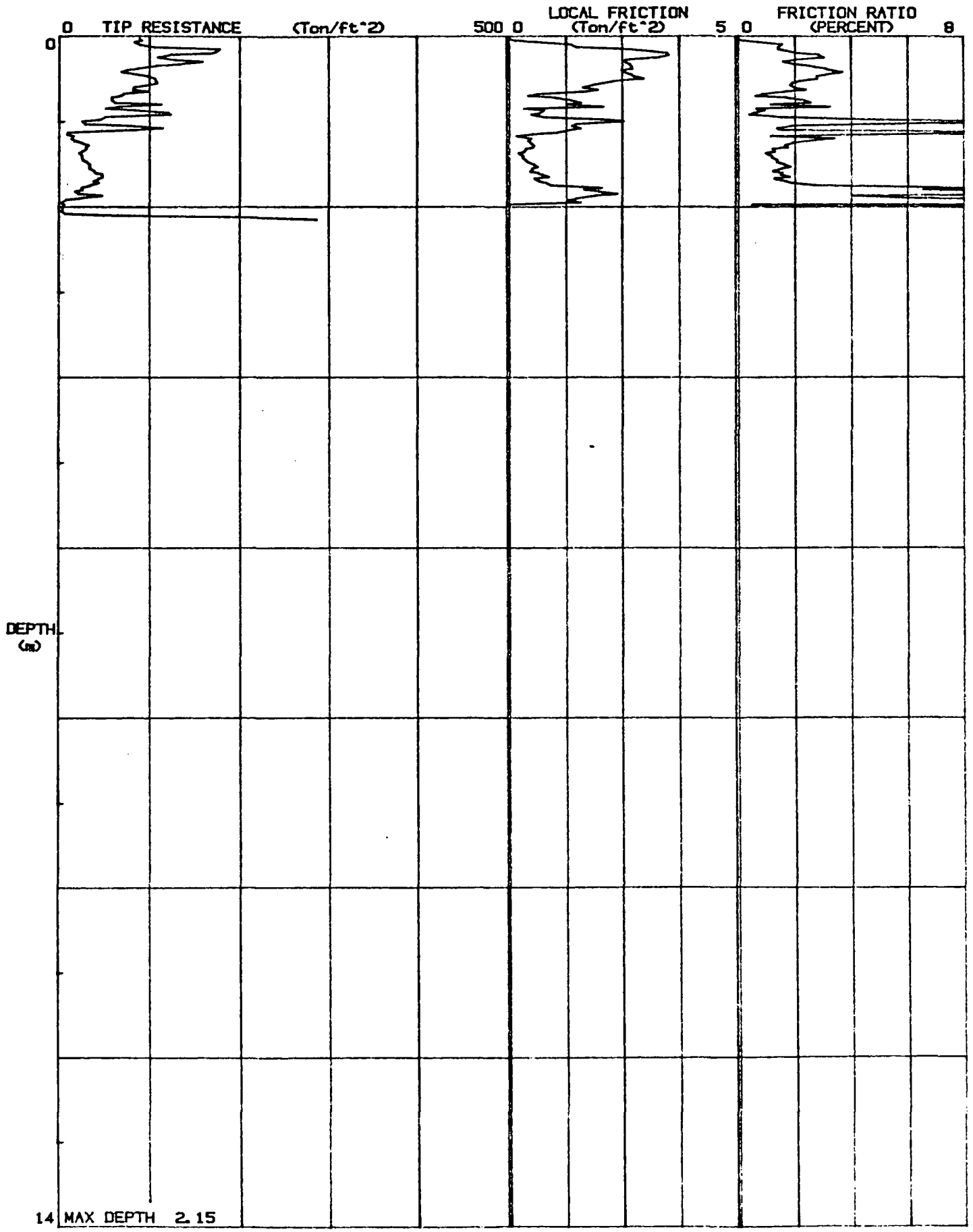

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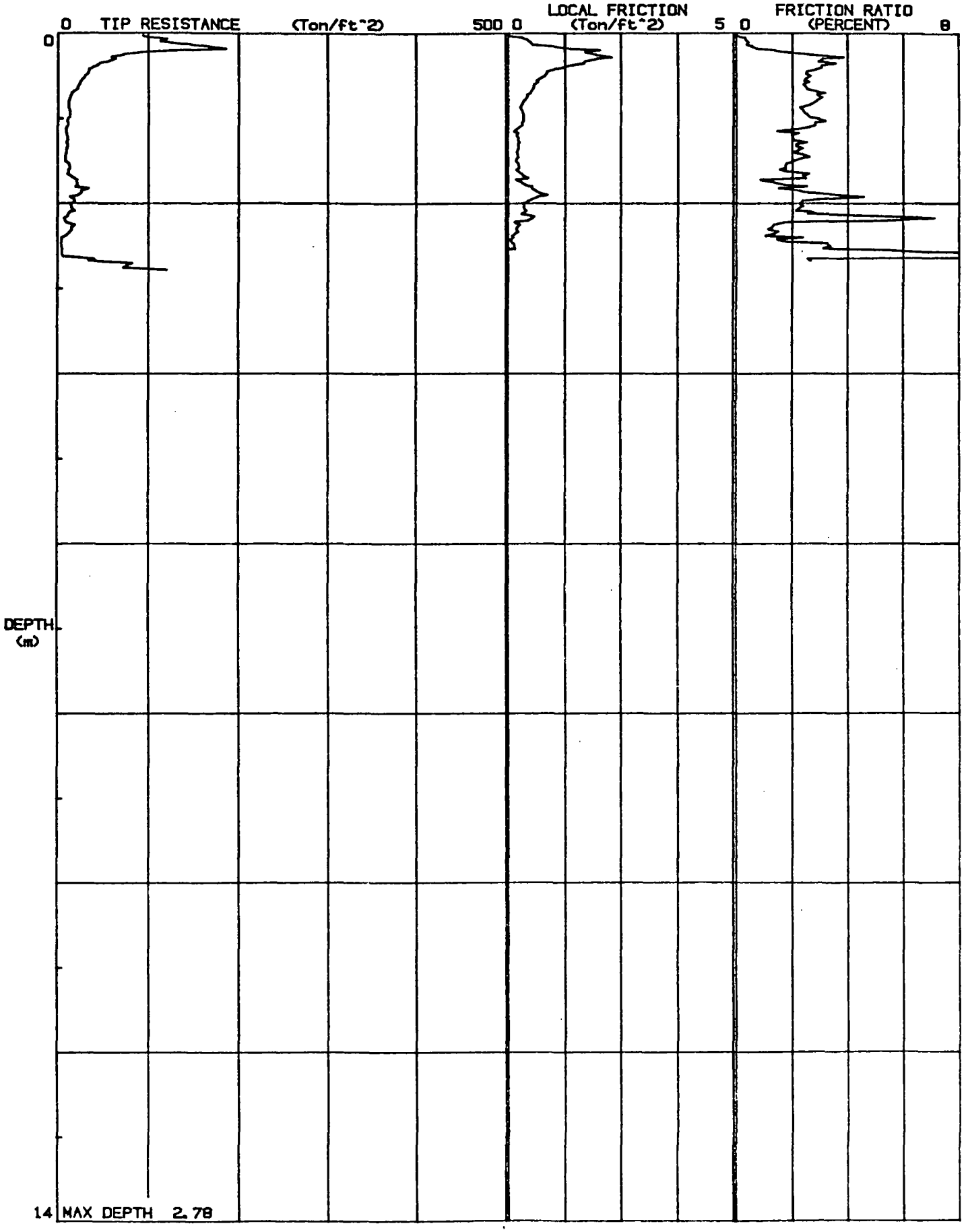

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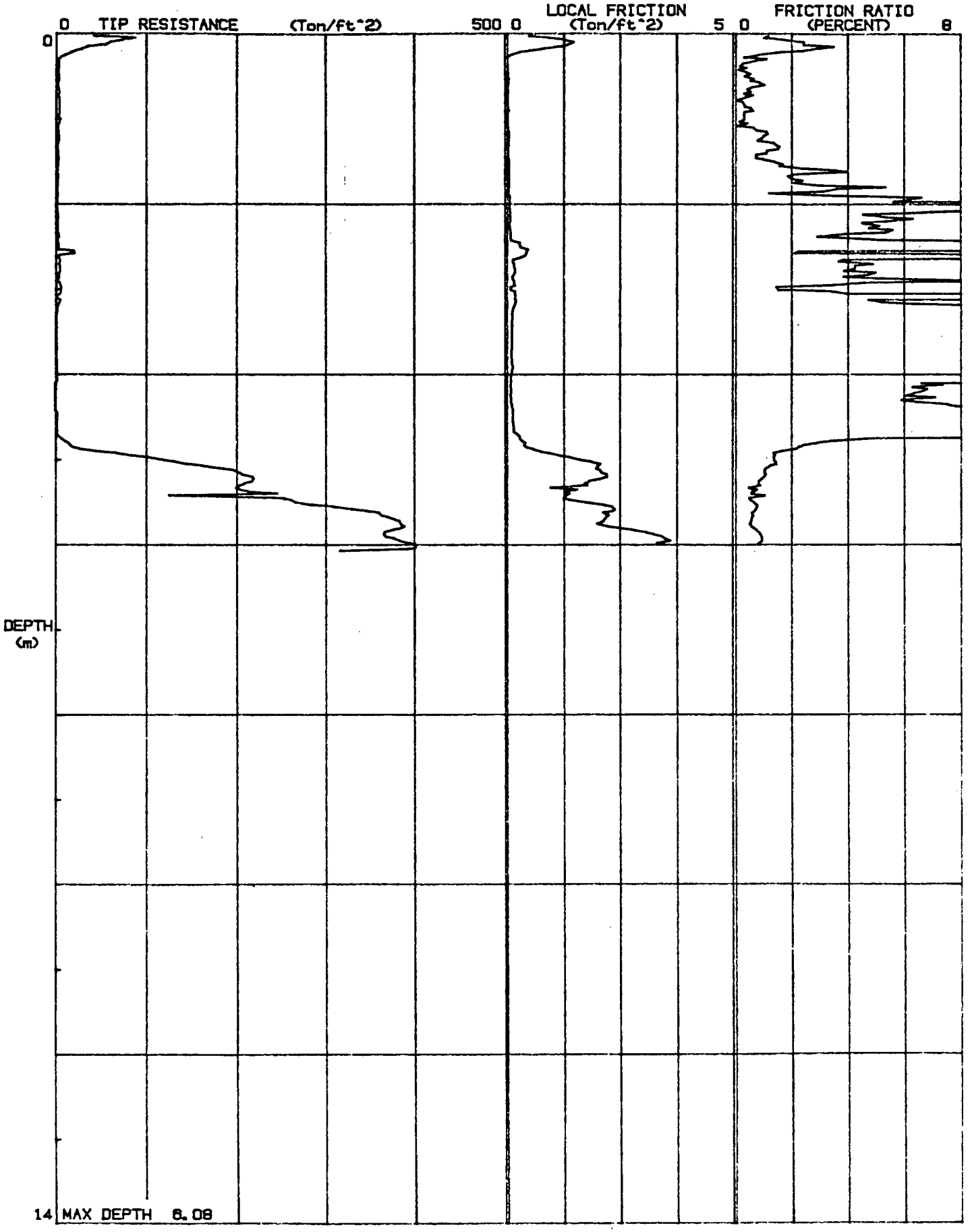

APPENDIX B

SOIL VAPOR ANALYTICAL RESULTS

certified testing laboratories, inc.
2905 EAST CENTURY BLVD. • SOUTH GATE, CALIF. 90280 • (213) 564-2641

RECEIVED AUG 1 4 1986

LAB NUMBER ES 86-4091

REPORTED 8/12/86 RECEIVED 7/9/86

CLIENT Dames & Moore
812 Anacapa Street, Suite A
Santa Barbara, CA 93101

Attn: Robert E. Troutman

MARKS Job #13262-011, Campbell Property.

INVESTIGATION Determine methane and total non-methane hydrocarbons (TNMHC) in air samples collected in stainless steel cylinders.

METHOD SUMMARY Methane and TNMHC was determined by gas chromatography utilizing a flame ionization detector.

RESULTS

Sample ID	Methane (ppm)	TNMHC as hexane (ppm)
V-1	9500	< 10
V-2	< 2	< 10
V-3	11200	28

Respectfully Submitted,
CTL ENVIRONMENTAL SERVICES

Stuart E. Salot, Ph.D